

Exercise

Chapte7 Polynomials

Build-up Exercise 7A (page 7.13)

1.

Power	Algebraic expression	Meaning
6 to the power 3	6^3	$6 \times 6 \times 6$
4 to the power 2	4^2	4×4
8 to the power 4	8^4	$8 \times 8 \times 8 \times 8$
a to the power 5	a^5	$a \times a \times a \times a \times a$
b to the power 3	b^3	$b \times b \times b$
c to the power 2	c^2	$c \times c$

$$2. \text{ (a) } a^2 \times a^4 = a^{2+4} \\ = \underline{\underline{a^6}}$$

$$\text{ (b) } a^5 \times a^3 = a^{5+3} \\ = \underline{\underline{a^8}}$$

$$\text{ (c) } 2a \times a^6 = 2 \times a \times a^6 \\ = 2(a^{1+6}) \\ = \underline{\underline{2a^7}}$$

$$3. \text{ (a) } (6b^2)(3b) = (6)(3)(b^2)(b) \\ = (18)(b^{2+1}) \\ = \underline{\underline{18b^3}}$$

$$\text{ (b) } (5b^2)(2b^6) = (5)(2)(b^2)(b^6) \\ = (10)(b^{2+6}) \\ = \underline{\underline{10b^8}}$$

$$\text{ (c) } (4b^4)(-7b^3) = (4)(-7)(b^4)(b^3) \\ = (-28)(b^{4+3}) \\ = \underline{\underline{-28b^7}}$$

$$4. \text{ (a) } (2c^2)(3c)(c^2) = (2)(3)(c^2)(c)(c^2) \\ = (6)(c^{2+1+2}) \\ = \underline{\underline{6c^5}}$$

$$\text{ (b) } (2c)(3c^2)(4c^3) = (2)(3)(4)(c)(c^2)(c^3) \\ = (24)(c^{1+2+3}) \\ = \underline{\underline{24c^6}}$$

$$\text{ (c) } (-8c^7)(5c^4)(3c^2) = (-8)(5)(3)(c^7)(c^4)(c^2) \\ = (-120)(c^{7+4+2}) \\ = \underline{\underline{-120c^{13}}}$$

$$5. \text{ (a) } d^3 \times d^2 e^3 = d^3 \times d^2 \times e^3 \\ = (d^{3+2})e^3 \\ = \underline{\underline{d^5 e^3}}$$

$$\text{ (b) } -e^3 \times d e^2 = -1 \times e^3 \times d \times e^2 \\ = -1 \times d \times e^3 \times e^2 \\ = -(d)(e^{3+2}) \\ = \underline{\underline{-de^5}}$$

$$\text{ (c) } d^6 e^5 \times d^2 = d^6 \times e^5 \times d^2 \\ = d^6 \times d^2 \times e^5 \\ = (d^{6+2})(e^5) \\ = \underline{\underline{d^8 e^5}}$$

$$6. \text{ (a) } 5m^4(m^2 n^7) = (5)(m^4)(m^2)(n^7) \\ = (5)(m^{4+2})(n^7) \\ = \underline{\underline{5m^6 n^7}}$$

$$\text{ (b) } n^5(-3m^3 n^2) = (n^5)(-3)(m^3)(n^2) \\ = (-3)(m^3)(n^5)(n^2) \\ = (-3)(m^3)(n^{5+2}) \\ = \underline{\underline{-3m^3 n^7}}$$

$$\text{ (c) } (-2mn^2)(-7m^3) = (-2)(m)(n^2)(-7)(m^3) \\ = (-2)(-7)(m)(m^3)(n^2) \\ = (14)(m^{1+3})(n^2) \\ = \underline{\underline{14m^4 n^2}}$$

$$\begin{aligned}
 7. \text{ (a) } (xy)(x^2y^3) &= (x)(y)(x^2)(y^3) \\
 &= (x)(x^2)(y)(y^3) \\
 &= (x^{1+2})(y^{1+3}) \\
 &= \underline{\underline{x^3y^4}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } (x^2y)(3xy) &= (x^2)(y)(3)(x)(y) \\
 &= (3)(x^2)(x)(y)(y) \\
 &= (3)(x^{2+1})(y^{1+1}) \\
 &= \underline{\underline{3x^3y^2}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } (5x^3y^2)(2x^2y^3) &= (5)(x^3)(y^2)(2)(x^2)(y^3) \\
 &= (5)(2)(x^3)(x^2)(y^2)(y^3) \\
 &= (10)(x^{3+2})(y^{2+3}) \\
 &= \underline{\underline{10x^5y^5}}
 \end{aligned}$$

$$\begin{aligned}
 8. \text{ (a) } -pq^2 \times p^3q^3 &= (-1)(p)(q^2)(p^3)(q^3) \\
 &= (-1)(p)(p^3)(q^2)(q^3) \\
 &= -(p^{1+3})(q^{2+3}) \\
 &= \underline{\underline{-p^4q^5}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } -2p^3q \times p^2q^3 &= (-2)(p^3)(q)(p^2)(q^3) \\
 &= (-2)(p^3)(p^2)(q)(q^3) \\
 &= (-2)(p^{3+2})(q^{1+3}) \\
 &= \underline{\underline{-2p^5q^4}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } 4pq^5 \times (-6p^4q) &= (4)(p)(q^5)(-6)(p^4)(q) \\
 &= (4)(-6)(p)(p^4)(q^5)(q) \\
 &= (-24)(p^{1+4})(q^{5+1}) \\
 &= \underline{\underline{-24p^5q^6}}
 \end{aligned}$$

$$\begin{aligned}
 9. \text{ } (-2m^6n^5)(11mn) &= (-2)(m^6)(n^5)(11)(m)(n) \\
 &= (-2)(11)(m^6)(m)(n^5)(n) \\
 &= (-22)(m^{6+1})(n^{5+1}) \\
 &= \underline{\underline{-22m^7n^6}}
 \end{aligned}$$

$$\begin{aligned}
 10. \text{ (a) } 2a^3 \times a^m &= 2a^5 \\
 (2)(a^3)(a^m) &= 2a^5 \\
 2a^{3+m} &= 2a^5 \\
 a^{3+m} &= a^5
 \end{aligned}$$

$$\begin{aligned}
 \therefore 3 + m &= 5 \\
 m &= \underline{\underline{2}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } x^2y^r \times 3x^sy &= 3x^3y^4 \\
 (x^2)(y^r)(3)(x^s)(y) &= 3x^3y^4 \\
 (3)(x^2)(x^s)(y^r)(y) &= 3x^3y^4 \\
 3x^{2+s}y^{r+1} &= 3x^3y^4 \\
 \therefore r + 1 &= 4 \\
 r &= \underline{\underline{3}} \\
 2 + s &= 3 \\
 s &= \underline{\underline{1}}
 \end{aligned}$$

$$\begin{aligned}
 11. \text{ Volume of the cuboid} &= (a)(b)(c) \\
 &= (a)(b)(2b) \\
 &= (2)(a)(b)(b) \\
 &= (2)(a)(2a)(2a) \\
 &= (8)(2x^3)(2x^3)(2x^3) \\
 &= (64)(x^{3+3+3}) \\
 &= \underline{\underline{64x^9}}
 \end{aligned}$$

***B**uild-up Exercise 7B* (page 7.15)

$$\begin{aligned}
 12. \text{ (a) } (x \times x)^3 &= (x^{1+1})^3 \\
 &= (x^2)^3 \\
 &= x^{2 \times 3} \\
 &= \underline{\underline{x^6}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } -(y \times y \times y)^2 &= -(y^{1+1+1})^2 \\
 &= -(y^3)^2 \\
 &= -y^{3 \times 2} \\
 &= \underline{\underline{-y^6}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } (-z \times z \times z \times z)^7 &= (-z^{1+1+1+1})^7 \\
 &= (-z^4)^7 \\
 &= (-1)^7(z^4)^7 \\
 &= (-1)(z^{4 \times 7}) \\
 &= \underline{\underline{-z^{28}}}
 \end{aligned}$$

$$\begin{aligned} 13. \text{ (a) } (-x^2)^4 &= (-1)^4(x^2)^4 \\ &= (1)(x^{2 \times 4}) \\ &= \underline{\underline{x^8}} \end{aligned}$$

$$\begin{aligned} \text{(b) } (y^4)^2 &= y^{4 \times 2} \\ &= \underline{\underline{y^8}} \end{aligned}$$

$$\begin{aligned} \text{(c) } (2z^5)^3 &= (2)^3(z^5)^3 \\ &= (8)(z^{5 \times 3}) \\ &= \underline{\underline{8z^{15}}} \end{aligned}$$

$$\begin{aligned} 14. \text{ (a) } \left(\frac{1}{2}a^3\right)^2 &= \left(\frac{1}{2}\right)^2(a^3)^2 \\ &= \left(\frac{1}{4}\right)(a^{3 \times 2}) \\ &= \underline{\underline{\frac{a^6}{4}}} \end{aligned}$$

$$\begin{aligned} \text{(b) } \left(\frac{2}{3}a^4\right)^3 &= \left(\frac{2}{3}\right)^3(a^4)^3 \\ &= \left(\frac{8}{27}\right)(a^{4 \times 3}) \\ &= \underline{\underline{\frac{8a^{12}}{27}}} \end{aligned}$$

$$\begin{aligned} \text{(c) } \left(-\frac{3}{4}a^5\right)^3 &= \left(-\frac{3}{4}\right)^3(a^5)^3 \\ &= \left(-\frac{27}{64}\right)(a^{5 \times 3}) \\ &= \underline{\underline{-\frac{27a^{15}}{64}}} \end{aligned}$$

$$\begin{aligned} 15. \text{ (a) } (2ab^2)^2 &= (2)^2(a)^2(b^2)^2 \\ &= (4)(a^2)(b^{2 \times 2}) \\ &= \underline{\underline{4a^2b^4}} \end{aligned}$$

$$\begin{aligned} \text{(b) } (-3a^2b^3)^3 &= (-3)^3(a^2)^3(b^3)^3 \\ &= (-27)(a^{2 \times 3})(b^{3 \times 3}) \\ &= \underline{\underline{-27a^6b^9}} \end{aligned}$$

$$\begin{aligned} \text{(c) } -(a^3b^4)^2 &= -(a^3)^2(b^4)^2 \\ &= -(a^{3 \times 2})(b^{4 \times 2}) \\ &= \underline{\underline{-a^6b^8}} \end{aligned}$$

$$\begin{aligned} 16. \text{ (a) } (a^2b^3)^4(ab)^2 &= (a^2)^4(b^3)^4(a)^2(b)^2 \\ &= (a^{2 \times 4})(b^{3 \times 4})(a^2)(b^2) \\ &= a^8a^2b^{12}b^2 \\ &= a^{8+2}b^{12+2} \\ &= \underline{\underline{a^{10}b^{14}}} \end{aligned}$$

$$\begin{aligned} \text{(b) } (2a^3b)(-2^2a^2b)^2 &= (2)(a^3)(b)(-4)^2(a^2)^2(b^2)^2 \\ &= (2)(a^3)(b)(16)(a^{2 \times 2})(b^2)^2 \\ &= (2)(16)(a^3)(a^4)(b)(b^2) \\ &= 32a^{3+4}b^{1+2} \\ &= \underline{\underline{32a^7b^3}} \end{aligned}$$

$$\begin{aligned} \text{(c) } (-2ab^2)^2(-3^2a^2b)^2 &= (-2)^2(a)^2(b^2)^2(-9)^2(a^2)^2(b)^2 \\ &= (4)(a^2)(b^{2 \times 2})(81)(a^{2 \times 2})(b^2) \\ &= (4)(81)(a^2)(a^4)(b^4)(b^2) \\ &= 324a^{2+4}b^{4+2} \\ &= \underline{\underline{324a^6b^6}} \end{aligned}$$

$$\begin{aligned} 17. \text{ (a) } (-xy)(-xy)(-xy)(-xy)(-xy) &= (-xy)^5 \\ &= (-1)^5(x)^5(y)^5 \\ &= \underline{\underline{-x^5y^5}} \end{aligned}$$

$$\begin{aligned} \text{(b) } (xy^2)(xy^2)(xy^2)^2 &= (xy^2)^4 \\ &= (x)^4(y^2)^4 \\ &= (x^4)(y^{2 \times 4}) \\ &= \underline{\underline{x^4y^8}} \end{aligned}$$

$$\begin{aligned} \text{(c) } (x^3y)^2(x^3y)(x^3y)^3(x^3y) &= (x^3y)^7 \\ &= (x^3)^7(y)^7 \\ &= (x^{3 \times 7})(y^7) \\ &= \underline{\underline{x^{21}y^7}} \end{aligned}$$

$$\begin{aligned} 18. \quad b^{3a} &= b^{a \times 3} \\ &= (b^a)^3 \\ &= 4^3 \\ &= \underline{\underline{64}} \end{aligned}$$

$$19. (a) (x \times x^n)^3 = x^{18}$$

$$(x^{1+n})^3 = x^{18}$$

$$x^{(1+n) \times 3} = x^{18}$$

$$x^{3+3n} = x^{18}$$

$$\therefore 3 + 3n = 18$$

$$3n = 15$$

$$n = \underline{\underline{5}}$$

$$(b) (xy^2 \times x^n y^2)^3 = x^{18} y^{4m}$$

$$[(x)(y^2)(x^n)(y^2)]^3 = x^{18} y^{4m}$$

$$[(x)(x^n)(y^2)(y^2)]^3 = x^{18} y^{4m}$$

$$(x^{1+n} y^4)^3 = x^{18} y^{4m}$$

$$(x^{1+n})^3 (y^4)^3 = x^{18} y^{4m}$$

$$[x^{(1+n) \times 3}](y^{4 \times 3}) = x^{18} y^{4m}$$

$$x^{3+3n} y^{12} = x^{18} y^{4m}$$

$$\therefore 12 = 4m$$

$$m = \underline{\underline{3}}$$

$$3 + 3n = 18$$

$$3n = 15$$

$$n = \underline{\underline{5}}$$

Build-up Exercise 7C (page 7.16)

$$20. (a) d^4 \div d = \frac{d^4}{d}$$

$$= d^{4-1}$$

$$= \underline{\underline{d^3}}$$

$$(b) d^{10} \div d^3 = \frac{d^{10}}{d^3}$$

$$= d^{10-3}$$

$$= \underline{\underline{d^7}}$$

$$(c) 2d^4 \div d^3 = \frac{2d^4}{d^3}$$

$$= 2(d^{4-3})$$

$$= \underline{\underline{2d}}$$

$$21. (a) -27c^3 \div 3c = \frac{-27c^3}{3c}$$

$$= -9(c^{3-1})$$

$$= \underline{\underline{-9c^2}}$$

$$(b) -8c^4 \div (-4c^2) = \frac{-8c^4}{-4c^2}$$

$$= 2(c^{4-2})$$

$$= \underline{\underline{2c^2}}$$

$$(c) -c^9 \div 2c^6 = \frac{-c^9}{2c^6}$$

$$= -\frac{c^{9-6}}{2}$$

$$= -\frac{c^3}{2}$$

$$22. (a) -6m^3 \div 18m^9 = \frac{-6m^3}{18m^9}$$

$$= \frac{-1}{3(m^{9-3})}$$

$$= -\frac{1}{3m^6}$$

$$(b) 9m^2 \div (-27m^3) = \frac{9m^2}{-27m^3}$$

$$= \frac{1}{-3(m^{3-2})}$$

$$= -\frac{1}{3m}$$

$$(c) -8m^3 \div (-16m^4) = \frac{-8m^3}{-16m^4}$$

$$= \frac{1}{2(m^{4-3})}$$

$$= \frac{1}{2m}$$

$$23. (a) \frac{x^3 y^4}{xy} = (x^{3-1})(y^{4-1})$$

$$= \underline{\underline{x^2 y^3}}$$

$$\begin{aligned} \text{(b)} \quad \frac{25x^6y^2}{5x^4y} &= 5(x^{6-4})(y^{2-1}) \\ &= \underline{\underline{5x^2y}} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \frac{-10x^6y^3}{5xy^2} &= -2(x^{6-1})(y^{3-2}) \\ &= \underline{\underline{-2x^5y}} \end{aligned}$$

$$\begin{aligned} 24. \text{ (a)} \quad \frac{x^4y^3}{x^7y^2} &= \frac{y^{3-2}}{x^{7-4}} \\ &= \underline{\underline{\frac{y}{x^3}}} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{100x^6y^6}{25x^4y^7} &= \frac{4(x^{6-4})}{y^{7-6}} \\ &= \underline{\underline{\frac{4x^2}{y}}} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \frac{-30x^3y^2}{-8x^5y^4} &= \frac{15}{4(x^{5-3})(y^{4-2})} \\ &= \underline{\underline{\frac{15}{4x^2y^2}}} \end{aligned}$$

$$\begin{aligned} 25. \text{ (a)} \quad \frac{(a^2b^3)^2}{a^3b} &= \frac{(a^2)^2(b^3)^2}{a^3b} \\ &= \frac{(a^{2 \times 2})(b^{3 \times 2})}{a^3b} \\ &= \frac{a^4b^6}{a^3b} \\ &= (a^{4-3})(b^{6-1}) \\ &= \underline{\underline{ab^5}} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{(3a^4b^2)^2}{3a^3b^4} &= \frac{(3)^2(a^4)^2(b^2)^2}{3a^3b^4} \\ &= \frac{9(a^{4 \times 2})(b^{2 \times 2})}{3a^3b^4} \\ &= \frac{9a^8b^4}{3a^3b^4} \\ &= 3(a^{8-3}) \\ &= \underline{\underline{3a^5}} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \frac{(-4a^2b)^2}{(2ab)^3} &= \frac{(-4)^2(a^2)^2(b)^2}{(2)^3(a)^3(b)^3} \\ &= \frac{16(a^{2 \times 2})(b^2)}{8a^3b^3} \\ &= \frac{16a^4b^2}{8a^3b^3} \\ &= \frac{2(a^{4-3})}{b^{3-2}} \\ &= \underline{\underline{\frac{2a}{b}}} \end{aligned}$$

$$26. (ab)^7(a^mb) \div (ab^n)^2 = a^7b^2$$

$$\frac{(ab)^7(a^mb)}{(ab^n)^2} = a^7b^2$$

$$\frac{(a)^7(b)^7(a^m)(b)}{(a)^2(b^n)^2} = a^7b^2$$

$$\frac{a^{7+m}b^{7+1}}{a^2b^{n \times 2}} = a^7b^2$$

$$\frac{a^{7+m}b^8}{a^2b^{2n}} = a^7b^2$$

$$a^{7+m-2}b^{8-2n} = a^7b^2$$

$$\therefore 7 + m - 2 = 7$$

$$m = \underline{\underline{2}}$$

$$8 - 2n = 2$$

$$n = \underline{\underline{3}}$$

$$\begin{aligned} 27. \text{ (a)} \quad a^3b^{21} \div ab^{20} &= \frac{a^3b^{21}}{ab^{20}} \\ &= (a^{3-1})(b^{21-20}) \\ &= a^2b \\ &= \left(\frac{1}{3}\right)^2(72) \\ &= \left(\frac{1}{9}\right)(72) \\ &= \underline{\underline{8}} \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad \frac{(ab^{15})^2(a^2b^{23})}{ab^{51}} &= \frac{(a)^2(b^{15})^2(a^2b^{23})}{ab^{51}} \\
 &= \frac{(a)^2(b^{15 \times 2})(a^2)(b^{23})}{ab^{51}} \\
 &= \frac{a^{2+2}b^{30+23}}{ab^{51}} \\
 &= \frac{a^4b^{53}}{ab^{51}} \\
 &= (a^{4-1})(b^{53-51}) \\
 &= a^3b^2 \\
 &= \left(\frac{1}{3}\right)^3(72)^2 \\
 &= \left(\frac{1}{27}\right)(5184) \\
 &= \underline{\underline{192}}
 \end{aligned}$$

Build-up Exercise 7D (page 7.17)

28.

Polynomial	Coefficient of x	Coefficient of y	Constant term
$4x + 2y + 1$	4	2	1
$3x + y + 2$	3	1	2
$5x - 3y - 3$	5	-3	-3
$2x + 4$	2	0	4
$3y - 5$	0	3	-5

29.

Number of terms	Degree of polynomial	Coefficient				Constant term
		x	x^2	x^3	xy	
5	3	4	3	2	2	5
4	3	5	4	3	0	-6
3	2	0	1	0	-5	7
4	3	0	3	1	5	$-\frac{1}{2}$
3	3	0	$\frac{1}{2}$	$-\frac{1}{3}$	4	0

30. (a) $2x + x = \underline{\underline{3x}}$

(b) $6x - 3x = \underline{\underline{3x}}$

(c) $3x - 2x - 5x = \underline{\underline{-4x}}$

31. (a) $6x + 2y - 4x + 3y = 6x - 4x + 2y + 3y$
 $= \underline{\underline{2x + 5y}}$

(b) $3 + 4x + 5x + 3 = 4x + 5x + 3 + 3$
 $= \underline{\underline{9x + 6}}$

(c) $4a^2 - 6b - 7b + 8a^2 + 5b$
 $= 4a^2 + 8a^2 - 6b - 7b + 5b$
 $= \underline{\underline{12a^2 - 8b}}$

32. (a) $2ab + 3ac - 4ab + 6ac$
 $= 2ab - 4ab + 3ac + 6ac$
 $= \underline{\underline{-2ab + 9ac}}$

(b) $9ab^2 - (-7a^2b) - 8ab^2 - 6a^2b - 7a^2b$
 $= 9ab^2 + 7a^2b - 8ab^2 - 6a^2b - 7a^2b$
 $= 7a^2b - 6a^2b - 7a^2b + 9ab^2 - 8ab^2$
 $= \underline{\underline{-6a^2b + ab^2}}$

(c) $2xy - 4xy^2 + 5x^2y + 6xy^2 - 7x^2y - 2xy$
 $= 5x^2y - 7x^2y + 2xy - 2xy - 4xy^2 + 6xy^2$
 $= \underline{\underline{-2x^2y + 2xy^2}}$

33. (a) Ascending powers: $\underline{\underline{3 - 4x + 5x^2}}$
 Descending powers: $\underline{\underline{5x^2 - 4x + 3}}$

(b) Ascending powers: $\underline{\underline{-9 + 20x + 3x^2}}$
 Descending powers: $\underline{\underline{3x^2 + 20x - 9}}$

(c) Ascending powers: $\underline{\underline{13 + 8x + 6x^2 - 2x^3}}$
 Descending powers: $\underline{\underline{-2x^3 + 6x^2 + 8x + 13}}$

34. (a) There are $\underline{\underline{2}}$ terms in the polynomial.

(b) The degree of the polynomial is $\underline{\underline{2}}$.

$$\begin{aligned}
 \text{(c)} \quad 1 + 2 + 3 + \cdots + 16 &= \frac{1}{2}(16)^2 + \frac{1}{2}(16) \\
 &= 128 + 8 \\
 &= \underline{\underline{136}}
 \end{aligned}$$

Build-up Exercise 7E (page 7.19)

$$\begin{array}{r}
 \text{35. (a)} \quad x + 1 \\
 +) \quad 2x + 1 \\
 \hline
 3x + 2
 \end{array}$$

$$\begin{array}{r}
 \text{(b)} \quad 3 - 5y \\
 +) \quad 7 - 2y \\
 \hline
 10 - 7y
 \end{array}$$

$$\begin{array}{r}
 \text{(c)} \quad 4x + 5y \\
 +) \quad 2x - 3y \\
 \hline
 6x + 2y
 \end{array}$$

$$\begin{array}{r}
 \text{(d)} \quad 5x - 6y \\
 +) \quad 8x + 4y \\
 \hline
 13x - 2y
 \end{array}$$

$$\begin{array}{r}
 \text{36. (a)} \quad 4x + 2 \\
 -) \quad 3x + 1 \\
 \hline
 x + 1
 \end{array}$$

$$\begin{array}{r}
 \text{(b)} \quad 8p + 1 \\
 -) \quad -5p - 3 \\
 \hline
 13p + 4
 \end{array}$$

$$\begin{array}{r}
 \text{(c)} \quad 5x - 4y \\
 -) \quad 3x - 9y \\
 \hline
 2x + 5y
 \end{array}$$

$$\begin{array}{r}
 \text{(d)} \quad 5x + 3y \\
 -) \quad 2x - 2y \\
 \hline
 3x + 5y
 \end{array}$$

$$\begin{array}{r}
 \text{37. (a)} \quad 5x - 6y + 7 \\
 +) \quad 2x + 4y - 3 \\
 \hline
 7x - 2y + 4
 \end{array}$$

$$\begin{array}{r}
 \text{(b)} \quad 4x - 5y - 6xy \\
 +) \quad 3y - 2xy \\
 \hline
 4x - 2y - 8xy
 \end{array}$$

$$\begin{array}{r}
 \text{(c)} \quad 3x - 2y + 4 \\
 -) \quad 2x + y + 1 \\
 \hline
 x - 3y + 3
 \end{array}$$

$$\begin{array}{r}
 \text{(d)} \quad 5p - 4q + 3z \\
 -) \quad 3p + 3z \\
 \hline
 2p - 4q
 \end{array}$$

$$\begin{aligned}
 \text{38. (a)} \quad (2x - 3y + 3) + (3x - y) &= 2x - 3y + 3 + 3x - y \\
 &= 2x + 3x - 3y - y + 3 \\
 &= \underline{\underline{5x - 4y + 3}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad (x + 2) + (x + y + 5) &= x + 2 + x + y + 5 \\
 &= x + x + y + 2 + 5 \\
 &= \underline{\underline{2x + y + 7}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad (4y + 5) - (5x - 2y + 4) \\
 &= 4y + 5 - 5x + 2y - 4 \\
 &= -5x + 4y + 2y + 5 - 4 \\
 &= \underline{\underline{-5x + 6y + 1}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad (3p - 4q + 5) - (-q - 1) &= 3p - 4q + 5 + q + 1 \\
 &= 3p - 4q + q + 5 + 1 \\
 &= \underline{\underline{3p - 3q + 6}}
 \end{aligned}$$

$$\begin{aligned}
 \text{39. (a)} \quad (y^2 - 8y + 9) + (y^2 + 4y - 5) \\
 &= y^2 - 8y + 9 + y^2 + 4y - 5 \\
 &= y^2 + y^2 - 8y + 4y + 9 - 5 \\
 &= \underline{\underline{2y^2 - 4y + 4}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad (2 + 4x - x^2) + (13 - x + 3x^2) \\
 &= 2 + 4x - x^2 + 13 - x + 3x^2 \\
 &= -x^2 + 3x^2 + 4x - x + 2 + 13 \\
 &= \underline{\underline{2x^2 + 3x + 15}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad & (6p^2 + 4p - 9) - (5p^2 + 4p - 8) \\
 &= 6p^2 + 4p - 9 - 5p^2 - 4p + 8 \\
 &= 6p^2 - 5p^2 + 4p - 4p - 9 + 8 \\
 &= \underline{p^2 - 1}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad & (1 - 7q + 5q^2) - (2 + q + 3q^2) \\
 &= 1 - 7q + 5q^2 - 2 - q - 3q^2 \\
 &= 5q^2 - 3q^2 - 7q - q + 1 - 2 \\
 &= \underline{2q^2 - 8q - 1}
 \end{aligned}$$

$$\begin{aligned}
 40. \text{ (a)} \quad & (5 + x^2 - 3x) + (x + 2) = 5 + x^2 - 3x + x + 2 \\
 &= x^2 - 3x + x + 5 + 2 \\
 &= \underline{x^2 - 2x + 7}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & (3a + a^2) - (-2a^2 + 5 + a) \\
 &= 3a + a^2 + 2a^2 - 5 - a \\
 &= a^2 + 2a^2 + 3a - a - 5 \\
 &= \underline{3a^2 + 2a - 5}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad & (5x + 10x^2 - 8) + (5x^2 + 2 - 4x) \\
 &= 5x + 10x^2 - 8 + 5x^2 + 2 - 4x \\
 &= 10x^2 + 5x^2 + 5x - 4x - 8 + 2 \\
 &= \underline{15x^2 + x - 6}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad & (-2a^2 + 10 + a) - (-3 - a^2 - 2a) \\
 &= -2a^2 + 10 + a + 3 + a^2 + 2a \\
 &= -2a^2 + a^2 + a + 2a + 10 + 3 \\
 &= \underline{-a^2 + 3a + 13}
 \end{aligned}$$

$$\begin{aligned}
 41. \text{ (a)} \quad & (7p^2 - 3pq - 2q^2) + (p^2 + q^2) \\
 &= 7p^2 - 3pq - 2q^2 + p^2 + q^2 \\
 &= 7p^2 + p^2 - 3pq - 2q^2 + q^2 \\
 &= \underline{8p^2 - 3pq - q^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & (8pq - 4p^3 + 6p^2) + (5p^3 - 6p^2 + 8pq) \\
 &= 8pq - 4p^3 + 6p^2 + 5p^3 - 6p^2 + 8pq \\
 &= -4p^3 + 5p^3 + 6p^2 - 6p^2 + 8pq + 8pq \\
 &= \underline{p^3 + 16pq}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad & (2p^2q + 5qp - 12) - (9 + 6pq + 4p^2q - p^2) \\
 &= 2p^2q + 5pq - 12 - 9 - 6pq - 4p^2q + p^2 \\
 &= 2p^2q - 4p^2q + 5pq - 6pq + p^2 - 12 - 9 \\
 &= \underline{-2p^2q - pq + p^2 - 21}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad & (3pqr + 6p^3q + 3q) - (2qp^3 - 5rqp) \\
 &= 3pqr + 6p^3q + 3q - 2p^3q + 5pqr \\
 &= 6p^3q - 2p^3q + 3pqr + 5pqr + 3q \\
 &= \underline{4p^3q + 8pqr + 3q}
 \end{aligned}$$

$$\begin{aligned}
 42. \text{ (a)} \quad & (r^2 - 7 - 6r) - (5r + 4r^2 - 9) + (-4r + 3r^2) \\
 &= r^2 - 7 - 6r - 5r - 4r^2 + 9 - 4r + 3r^2 \\
 &= r^2 - 4r^2 + 3r^2 - 6r - 5r - 4r - 7 + 9 \\
 &= \underline{-15r + 2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & (8 + 5r^2 + 3r) - (r - 3r^2) - (-9r^2 - 3r + 4) \\
 &= 8 + 5r^2 + 3r - r + 3r^2 + 9r^2 + 3r - 4 \\
 &= 5r^2 + 3r^2 + 9r^2 + 3r - r + 3r + 8 - 4 \\
 &= \underline{17r^2 + 5r + 4}
 \end{aligned}$$

$$\begin{aligned}
 43. \quad & \text{Score of Charles in the second Chinese Language test} \\
 &= (3x - 4y + 1) + (-2x + 7y + 8) \\
 &= 3x - 4y + 1 - 2x + 7y + 8 \\
 &= 3x - 2x - 4y + 7y + 1 + 8 \\
 &= \underline{x + 3y + 9}
 \end{aligned}$$

$$\begin{aligned}
 44. \quad & \text{Difference in the number of passengers} \\
 &= (x + 3y - 1) + (2x + 3) - (6 - 2x + y) - (y - 4) \\
 &= x + 3y - 1 + 2x + 3 - 6 + 2x - y - y + 4 \\
 &= x + 2x + 2x + 3y - y - y - 1 + 3 - 6 + 4 \\
 &= \underline{5x + y}
 \end{aligned}$$

$$\begin{aligned}
 45. \text{ (a)} \quad & \text{Perimeter of rectangle } ABCD \\
 &= [(4x + 5y + 6) + (12x - 7y + 2) \\
 &\quad + (4x + 5y + 6) + (12x - 7y + 2)] \text{ cm} \\
 &= (4x + 5y + 6 + 12x - 7y + 2 \\
 &\quad + 4x + 5y + 6 + 12x - 7y + 2) \text{ cm} \\
 &= (4x + 12x + 4x + 12x \\
 &\quad + 5y - 7y + 5y - 7y + 6 + 2 + 6 + 2) \text{ cm} \\
 &= \underline{(32x - 4y + 16) \text{ cm}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) (i)} \quad AB &= (4x + 5y + 6) \text{ cm} \\
 &= [4(2y) + 5y + 6] \text{ cm} \\
 &= (8y + 5y + 6) \text{ cm} \\
 &= \underline{(13y + 6) \text{ cm}}
 \end{aligned}$$

$$\begin{aligned}
 AD &= (12x - 7y + 2) \text{ cm} \\
 &= [12(2y) - 7y + 2] \text{ cm} \\
 &= (24y - 7y + 2) \text{ cm} \\
 &= \underline{(17y + 2) \text{ cm}}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Perimeter of rectangle } ABCD \\
 &= [(13y + 6) + (17y + 2) + (13y + 6) \\
 &\quad + (17y + 2)] \text{ cm} \\
 &= (13y + 6 + 17y + 2 + 13y + 6 \\
 &\quad + 17y + 2) \text{ cm} \\
 &= (13y + 17y + 13y + 17y + 6 + 2 \\
 &\quad + 6 + 2) \text{ cm} \\
 &= \underline{(60y + 16) \text{ cm}}
 \end{aligned}$$

Build-up Exercise 7F (page 7.22)

$$\begin{aligned}
 46. \text{ (a)} \quad 2(x + 1) &= 2(x) + 2(1) \\
 &= \underline{2x + 2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad 3(1 - y) &= 3(1) + 3(-y) \\
 &= \underline{3 - 3y}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad (3x + y)(2) &= (3x)(2) + (y)(2) \\
 &= \underline{6x + 2y}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad (x - 2y)(3) &= (x)(3) + (-2y)(3) \\
 &= \underline{3x - 6y}
 \end{aligned}$$

$$\begin{aligned}
 47. \text{ (a)} \quad 2x(3y + 1) &= (2x)(3y) + (2x)(1) \\
 &= \underline{6xy + 2x}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad -x(2 + 4y) &= (-x)(2) + (-x)(4y) \\
 &= \underline{-2x - 4xy}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad (-3 + y)(3x) &= (-3)(3x) + (y)(3x) \\
 &= \underline{-9x + 3xy}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad (-2y - 4)(-2x) &= (-2y)(-2x) + (-4)(-2x) \\
 &= \underline{4xy + 8x}
 \end{aligned}$$

$$\begin{aligned}
 48. \text{ (a)} \quad a(a^2 - b^2) &= (a)(a^2) - (a)(b^2) \\
 &= \underline{a^3 - ab^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad (2a^2 + 3b)(b) &= (2a^2)(b) + (3b)(b) \\
 &= \underline{2a^2b + 3b^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad x^2(x + 3) &= (x^2)(x) + (x^2)(3) \\
 &= \underline{x^3 + 3x^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad (x - y)(y^2) &= (x)(y^2) + (-y)(y^2) \\
 &= \underline{xy^2 - y^3}
 \end{aligned}$$

$$\begin{aligned}
 49. \text{ (a)} \quad (2x - 7)(3x + 4) \\
 &= (2x - 7)(3x) + (2x - 7)(4) \\
 &= (2x)(3x) + (-7)(3x) + (2x)(4) + (-7)(4) \\
 &= 6x^2 - 21x + 8x - 28 \\
 &= \underline{6x^2 - 13x - 28}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad (5 - 2x)(3 - 2x) \\
 &= (5 - 2x)(3) + (5 - 2x)(-2x) \\
 &= (5)(3) + (-2x)(3) + (5)(-2x) + (-2x)(-2x) \\
 &= 15 - 6x - 10x + 4x^2 \\
 &= \underline{15 - 16x + 4x^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad (8y - 8)(9 - 3y) \\
 &= (8y - 8)(9) + (8y - 8)(-3y) \\
 &= (8y)(9) - (8)(9) + (8y)(-3y) + (-8)(-3y) \\
 &= 72y - 72 - 24y^2 + 24y \\
 &= -24y^2 + 72y + 24y - 72 \\
 &= \underline{-24y^2 + 96y - 72}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad (4y + 9)(y - 3) \\
 &= (4y + 9)(y) + (4y + 9)(-3) \\
 &= (4y)(y) + (9)(y) + (4y)(-3) + (9)(-3) \\
 &= 4y^2 + 9y - 12y - 27 \\
 &= \underline{4y^2 - 3y - 27}
 \end{aligned}$$

$$\begin{aligned}
 50. \text{ (a)} \quad (x - 7)(3x - 2y) \\
 &= (x - 7)(3x) + (x - 7)(-2y) \\
 &= (x)(3x) + (-7)(3x) + (x)(-2y) + (-7)(-2y) \\
 &= 3x^2 - 21x - 2xy + 14y \\
 &= \underline{3x^2 - 2xy - 21x + 14y}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & (2x + 3y)(5 + y) \\
 &= (2x + 3y)(5) + (2x + 3y)(y) \\
 &= (2x)(5) + (3y)(5) + (2x)(y) + (3y)(y) \\
 &= 10x + 15y + 2xy + 3y^2 \\
 &= \underline{3y^2 + 2xy + 10x + 15y}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad & (-x - 4)(3y - x) \\
 &= (-x - 4)(3y) + (-x - 4)(-x) \\
 &= (-x)(3y) + (-4)(3y) + (-x)(-x) + (-4)(-x) \\
 &= -3xy - 12y + x^2 + 4x \\
 &= \underline{x^2 - 3xy + 4x - 12y}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad & (-4x + 5)(y + x) \\
 &= (-4x + 5)(y) + (-4x + 5)(x) \\
 &= (-4x)(y) + (5)(y) + (-4x)(x) + (5)(x) \\
 &= -4xy + 5y - 4x^2 + 5x \\
 &= \underline{-4x^2 - 4xy + 5x + 5y}
 \end{aligned}$$

$$\begin{aligned}
 51. \text{ (a)} \quad & (-10m^2 - 4m + 8)(9m - 7) \\
 &= (-10m^2 - 4m + 8)(9m) \\
 &\quad + (-10m^2 - 4m + 8)(-7) \\
 &= (-10m^2)(9m) + (-4m)(9m) + (8)(9m) \\
 &\quad + (-10m^2)(-7) + (-4m)(-7) + (8)(-7) \\
 &= -90m^3 - 36m^2 + 72m + 70m^2 + 28m - 56 \\
 &= -90m^3 - 36m^2 + 70m^2 + 72m + 28m - 56 \\
 &= \underline{-90m^3 + 34m^2 + 100m - 56}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & (-12m + 7)(9m - 10m^2 - 12) \\
 &= (-12m)(9m - 10m^2 - 12) \\
 &\quad + (7)(9m - 10m^2 - 12) \\
 &= (-12m)(9m) + (-12m)(-10m^2) + (-12m)(-12) \\
 &\quad + (7)(9m) + (7)(-10m^2) + (7)(-12) \\
 &= -108m^2 + 120m^3 + 144m + 63m - 70m^2 - 84 \\
 &= 120m^3 - 108m^2 - 70m^2 + 144m + 63m - 84 \\
 &= \underline{120m^3 - 178m^2 + 207m - 84}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad & (9m^2 - 12m + 11)(7m^2 + 6m) \\
 &= (9m^2 - 12m + 11)(7m^2) \\
 &\quad + (9m^2 - 12m + 11)(6m) \\
 &= (9m^2)(7m^2) + (-12m)(7m^2) + (11)(7m^2) \\
 &\quad + (9m^2)(6m) + (-12m)(6m) + (11)(6m) \\
 &= 63m^4 - 84m^3 + 77m^2 + 54m^3 - 72m^2 + 66m \\
 &= 63m^4 - 84m^3 + 54m^3 + 77m^2 - 72m^2 + 66m \\
 &= \underline{63m^4 - 30m^3 + 5m^2 + 66m}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad & (2m^2 - m)(7m^2 - 8m + 5) \\
 &= (2m^2)(7m^2 - 8m + 5) + (-m)(7m^2 - 8m + 5) \\
 &= (2m^2)(7m^2) + (2m^2)(-8m) + (2m^2)(5) \\
 &\quad + (-m)(7m^2) + (-m)(-8m) + (-m)(5) \\
 &= 14m^4 - 16m^3 + 10m^2 - 7m^3 + 8m^2 - 5m \\
 &= 14m^4 - 16m^3 - 7m^3 + 10m^2 + 8m^2 - 5m \\
 &= \underline{14m^4 - 23m^3 + 18m^2 - 5m}
 \end{aligned}$$

$$\begin{aligned}
 52. \text{ (a)} \quad & (3x - 2y)(x^2 + xy + y^2) \\
 &= (3x)(x^2 + xy + y^2) + (-2y)(x^2 + xy + y^2) \\
 &= (3x)(x^2) + (3x)(xy) + (3x)(y^2) \\
 &\quad + (-2y)(x^2) + (-2y)(xy) + (-2y)(y^2) \\
 &= 3x^3 + 3x^2y + 3xy^2 - 2x^2y - 2xy^2 - 2y^3 \\
 &= 3x^3 + 3x^2y - 2x^2y + 3xy^2 - 2xy^2 - 2y^3 \\
 &= \underline{3x^3 + x^2y + xy^2 - 2y^3}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & (x - y)(4x^2 + y - 8) \\
 &= (x)(4x^2 + y - 8) + (-y)(4x^2 + y - 8) \\
 &= (x)(4x^2) + (x)(y) + (x)(-8) \\
 &\quad + (-y)(4x^2) + (-y)(y) + (-y)(-8) \\
 &= 4x^3 + xy - 8x - 4x^2y - y^2 + 8y \\
 &= \underline{4x^3 - 4x^2y + xy - y^2 - 8x + 8y}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c)} \quad & (4x^2 + 9 - 6x)(x + 5y) \\
 &= (4x^2 + 9 - 6x)(x) + (4x^2 + 9 - 6x)(5y) \\
 &= (4x^2)(x) + (9)(x) + (-6x)(x) \\
 &\quad + (4x^2)(5y) + (9)(5y) + (-6x)(5y) \\
 &= 4x^3 + 9x - 6x^2 + 20x^2y + 45y - 30xy \\
 &= \underline{4x^3 + 20x^2y - 6x^2 - 30xy + 9x + 45y}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d)} \quad & (2xy - x^2 + y)(x - 1) \\
 &= (2xy - x^2 + y)(x) + (2xy - x^2 + y)(-1) \\
 &= (2xy)(x) + (-x^2)(x) + (y)(x) \\
 &\quad + (2xy)(-1) + (-x^2)(-1) + (y)(-1) \\
 &= 2x^2y - x^3 + xy - 2xy + x^2 - y \\
 &= -x^3 + 2x^2y + x^2 + xy - 2xy - y \\
 &= \underline{-x^3 + 2x^2y + x^2 - xy - y}
 \end{aligned}$$

$$\begin{aligned}
 53. \text{ (a)} \quad & (x - 2y)(3x + y) + 2x(x - y) \\
 &= (x - 2y)(3x) + (x - 2y)(y) + (2x)(x) \\
 &\quad + (2x)(-y) \\
 &= (x)(3x) + (-2y)(3x) + (x)(y) + (-2y)(y) \\
 &\quad + 2x^2 - 2xy \\
 &= 3x^2 - 6xy + xy - 2y^2 + 2x^2 - 2xy \\
 &= 3x^2 + 2x^2 - 6xy + xy - 2xy - 2y^2 \\
 &= \underline{5x^2 - 7xy - 2y^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & [(a - b) - (2a - 3b)](a - b) \\
 &= (a - b - 2a + 3b)(a - b) \\
 &= (a - 2a - b + 3b)(a - b) \\
 &= (-a + 2b)(a - b) \\
 &= (-a + 2b)(a) + (-a + 2b)(-b) \\
 &= (-a)(a) + (2b)(a) + (-a)(-b) + (2b)(-b) \\
 &= -a^2 + 2ab + ab - 2b^2 \\
 &= \underline{-a^2 + 3ab - 2b^2}
 \end{aligned}$$

54. Area of the trapezium

$$\begin{aligned}
 &= \frac{(AB + CD) \times AE}{2} \\
 &= \frac{[2x + (2x + 5)] \times (x + 3)}{2} \text{ cm}^2 \\
 &= \frac{(2x + 2x + 5)(x + 3)}{2} \text{ cm}^2 \\
 &= \frac{(4x + 5)(x + 3)}{2} \text{ cm}^2 \\
 &= \frac{(4x)(x) + (5)(x) + (4x)(3) + (5)(3)}{2} \text{ cm}^2 \\
 &= \frac{4x^2 + 5x + 12x + 15}{2} \text{ cm}^2 \\
 &= \frac{4x^2 + 17x + 15}{2} \text{ cm}^2 \\
 &= \left(\frac{4x^2}{2} + \frac{17x}{2} + \frac{15}{2}\right) \text{ cm}^2 \\
 &= \underline{\underline{\left(2x^2 + \frac{17}{2}x + \frac{15}{2}\right) \text{ cm}^2}}
 \end{aligned}$$

55. (a) Amount spent by Marco on buying apples

$$\begin{aligned}
 &= \$ (3y + 5)(2x + 3) \\
 &= \$ [(3y + 5)(2x) + (3y + 5)(3)] \\
 &= \$ [(3y)(2x) + (5)(2x) + (3y)(3) + (5)(3)] \\
 &= \underline{\underline{\$ (6xy + 10x + 9y + 15)}}
 \end{aligned}$$

(b) Amount spent by Marco on buying pears

$$\begin{aligned}
 &= \$ (2y + 3)(4x + 1) \\
 &= \$ [(2y + 3)(4x) + (2y + 3)(1)] \\
 &= \$ [(2y)(4x) + (3)(4x) + 2y + 3] \\
 &= \underline{\underline{\$ (8xy + 12x + 2y + 3)}}
 \end{aligned}$$

(c) Total amount spent on buying apples and pears

$$\begin{aligned}
 &= \$ [(6xy + 10x + 9y + 15) + (8xy + 12x + 2y + 3)] \\
 &= \$ (6xy + 10x + 9y + 15 + 8xy + 12x + 2y + 3) \\
 &= \$ (6xy + 8xy + 10x + 12x + 9y + 2y + 15 + 3) \\
 &= \underline{\underline{\$ (14xy + 22x + 11y + 18)}}
 \end{aligned}$$